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Original Research

Determinants of Emergency Obstetrics Hysterectomy in Ayder Comprehensive Specialized Hospital Five Years data: A case-control study.

Asmera Tulu[1*], Merga Besho[2], Merga Chala[2], Diriba Bayisa[2] & Tilahun Bekele[2]

[1]Department of Midwifery, College of Health Sciences, Salale University, Fiche, Ethiopia.
[2]Department of Midwifery, Institute of Health Sciences, Wollega University, Nekemte, Ethiopia.

Abstract

Background: *Emergency obstetrics hysterectomy refers to the surgical removal of the uterus either at the time of delivery or within a post-partum period to avert maternal death in case of severe hemorrhage. This life-saving obstetrics management has been used for over 100 years. The incidence of EOH is 2.8 per 1000 in low-income countries compared to 0.7 per 1000 in high-income countries. This study aimed to identify determinants of emergency obstetric hysterectomy at Ayder Comprehensive Specialized Hospital for five years from 1 October 2013 to 30 September 2017.*

Methods*: A public hospital-based, unmatched case-control study was conducted on 220 cards (55 cases and 165 controls) over five years (1 October 2013 to 30 September 2017). A simple random sampling method was used to select study subjects. Two trained data collectors collected data. EPI-Info version 3.5.1 was used for data entry and cleaning before being transferred to SPSS version 20.0 for analysis. The odds ratio is used in bivariate and multivariate logistic regression to evaluate the statistical relationship between dependent and independent variables; a 95% CI and P value <0.05 were used to test for statistical significance. in the bivariate logistic regression analysis, factors with a P value <0.05 level were considered statistically significant.*

Result: Determinants significantly associated with emergency obstetrics hysterectomy were parity ≥5 (AOR = 4.218 (1.804-9.861), 95% CI), uterine rupture (AOR = 19.816 (6.186-63.472), 95% CI), and uterine atony (AOR = 4.723 (1.71-13), 95% CI). Morbid adherent placenta, antenatal follow-up, and previous cesarean section were also identified as determinants of emergency obstetrics hysterectomy.

Conclusion*: In this study, the identified determinants of emergency obstetrics hysterectomy were parity >5, antenatal follow-up, previous cesarean section, morbid adherent placenta, uterine rupture, and uterine atony. Prevention of obstructed labour and consequently ruptured uterus and uterine atony by using pantograph and antenatal care will reduce emergency obstetrics hysterectomy.*

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*Corresponding Author:
Asmera Tulu

E-mail:
asmera@gmail.com

INTRODUCTION

Emergency obstetrical hysterectomy refers to the surgical removal of the uterus either at the time of delivery or within the puerperium period in the case of severe hemorrhage (1-4). Despite its rarity in modern obstetrics, emergency obstetric hysterectomy is a life-saving surgical operation used as a last option to manage obstetric complications whenever other treatments are ineffective. This is a catastrophic issue that leads to significant healthcare expenses and negative outcomes for women who want to retain their fertility (5, 6). This life-saving obstetrics management has been used for over 100 years since Edward Porro (1876) published the first case report of emergency obstetrics hysterectomy (7).

Emergency obstetrics hysterectomy complicated almost 1 per 1,000 deliveries (range 2 -10.1). The incidence of EOH is 2.8 per 1000 in low-income countries compared to 0.7 per 1000 in high-income countries. The incidence of emergency obstetric hysterectomy (EOH) varies from country to country. It is affected by many determinant factors like availability of good antenatal care (ANC) and obstetrics care, educational status of patients, general health awareness of society, and mode of delivery (8-10). This case is markedly low in developed countries due to good antenatal care (11). Worldwide, the incidence of obstetric hysterectomy has been increasing 8% annually (12).

EOH is more common in developing countries due to the high incidence of non-booked and improperly supervised deliveries (13-16). According to the 2016 EDHS report, only 62% of women received antenatal care (ANC) from a skilled provider, and only 26% gave birth at an institution. Ethiopia has been making significant progress in reducing maternal mortality by addressing major challenges in the health sector through its innovative health extension program, accelerated midwifery training, integrated emergency surgery and obstetrics task shifting, and scaling up family planning (FP). However, according to the Ethiopia Demographic and Health Survey (EDHS) 2016, the maternal mortality ratio was 412 per 100,000 live births (17). Determinants of emergency obstetrics hysterectomy have changed throughout the years. In developed countries, uterine atony and uterine rupture are rare causes of hemorrhage, but they are the most common causes of hemorrhage in developing countries. Cesarean delivery has been linked to higher rates of placenta Previa and accretes globally, including in industrialized countries. (10, 11). Early identification of risk factors, adequate antenatal and obstetric care, and referral to a tertiary facility can help prevent obstetric hysterectomies (10).

In Ethiopia, there is a scarcity of information about the determinants of emergency obstetrics hysterectomy. By considering this, the current hospital-based study was undertaken in Ayder Compressive Specialized Hospital through a five-year retrospective records review. This study identifies determinants of EOH for early intervention and to make an informed decision towards preventing some determinants and a goal to reduce maternal mortality.

METHODS

Study Period and Setting

A hospital-based case-control study was conducted at Ayder Comprehensive Specialized Hospital (ACSH), located in Mekelle town of Tigray regional state of

Ethiopia, from October 2013 to September 2017.

Study Design

An unmatched case-control study design was employed.

Population

Source Population

Cards of all women delivered and treated for obstetric signs at the Department of Obstetrics and Gynecology unit in ACSH from 1 October 2013 to 30 September 2017.

Study Population

Cases: Medical charts of all mothers who underwent emergency obstetrics hysterectomy for obstetric signs after 28 weeks of GA from 1 October 2013 to 30 September 2017.

Control: Cards of all mothers who give birth and EOH not done from 1 October 2013 to 30 September 2017.

Sample size determination

The sample size was determined by using a double population proportion formula with an unequal sample size, using the following assumption: The sample size was determined by the statistics program EPINFO.

Level of significance, $\alpha = 0.05$, Power $1-\beta$ = 90%, Control to case ratio, = 3:1(r)

Proportion of exposure among control (hysterectomy was not done), p1 = 0. 424

The proportion of exposure among the case (hysterectomy was done), p2 = 13.3

Population proportion: P = p1+p2/1+r = 3.431

The final sample size was 55 cases and 165 control groups, giving a total sample size of 220.

Sampling procedures

Simple random sampling techniques were used for both cases and controls. Card numbers of all cases are identified from major OR log books and all card numbers of mothers who have been delivered for five years (from 1 October 2013 to 30 September 2017). Then, three controls per case were chosen randomly using a computer-generated simple random sampling technique. For both case and control, a new card was used instead of the misplaced or egregiously lacking one.

Inclusion and Exclusion Criteria

Inclusion criteria:

C**ases**: cards of all women for whom emergency obstetrics hysterectomy was done for obstetric indications at the time of delivery or within the time of puerperium in ASCH from 1 October 2013 to 30 September 2017 were included.

Controls-Card of all mothers who give birth but EOH was not done in ASCH 1 October 2013 to 30 September 2017 were included.

Exclusion criteria

The card misses main independent variables like GA, parity, age, and operation note and the discharge summary was excluded.

Data collection procedure:

Data sources were the five-year-major operations log book, delivery log books, and obstetrics patient charts. A simple random sampling method identifies the number of women in the study. The data collectors retrieved the patient cards. The data were collected by two data collectors by using a checklist.

Data Processing and Analysis

For analysis, the gathered data was imported into EPI-Info version 3.51 and exported to SPSS version 21 software. Bivariate and multivariate logistic regression was also calculated to evaluate the statistical relationship between dependent and independent variables. The significance of the

statistical association was assessed using the odds ratio. In the multivariable logistic regression analysis, characteristics with a p-value <0.05 at 95% CI were deemed statistically significant predictors of emergency obstetric hysterectomy. Tables were used to display descriptive statistics.

Operational Definition

Associated obstetric problems: maternal conditions like previous CS, PPH/APH, sepsis, trauma and previous fistula repair that are identified before emergency obstetrics are done.

Cases- Cards of all mothers whose emergency obstetrics hysterectomy is done after 28 weeks of gestational age

Control- Card of all mothers who give birth and EOH not done.

Morbid adherent placenta: abnormal placenta invasion includes placenta accrete, increate, and percreta.

RESULTS

Socio-demographic characteristics of study subjects

This study indicates that 37 (67.3%) of cases and 84 (50.9%) controls were above 35 years. The age of study subjects shows that it is normally distributed at a range of 18-46 and a range of 18-44) in cases and controls, respectively. More cases than controls were from rural areas (74.5% versus 64.8%) (Table 1).

Table 1: Socio-demographic characteristics of study subject in Ayder compressive specialized Hospital from September 2012 to December 2017 (n=220).

Characteristics	Case (n %)	Control (n %)	Total (n %)
Age in year			
≥35	37(67.3)	84(50.9)	121(55.0)
<35	18(32.7)	81(49.1)	99(45%)
Mean ±SD	35±6	31±8	
Residency			
Rural	41(74.5)	107(64.8)	148(67.3)
Urban	14(25.5)	58(35.2)	72(34.5)

Obstetrics characteristics of study subjects

Among study subjects, more cases than controls were grand multipara (parity > 5) (63.6% versus 33.9%). More cases than controls give birth through abdominal delivery, which accounts for 51 (92.7%) of cases and 50 (30.3%) for controls. Among study subjects, 30 (54.5%) cases and 131 (79.4%) controls give birth at a gestational age of 37-41 weeks. The majority of the birth weights, born from both cases, 36 (65.5%) and controls 136 (82.4%), were 2500-3999 grams. Among study subjects, 6(10.9%) of mothers whom EOH had done (cases) and 25(15.2%) of controls had premature rupture of membrane (PROM) during their admission, in which 4(2.4%) of cases and 4(7.3%) of controls had developed chorioamnitis. More cases than control had uterine rupture (21 (38.2%) versus 6 (3.6%)

Almost all (98.2%) of study subjects gave singleton birth, which accounts for 53 (96.4%) cases and 163 (98.8%) controls. More cases had morbid adherent placenta [15 (27.3%) versus 8 (4.8%)]. More cases than controls had a history of uterine atony (30.9% versus 12.1%). Among study subjects, 5 (9.1%) cases and 18 (10.9%) control were augmented or induced. Among the study subjects, 34(61.8%) of cases and 158(95.8%) control had labor at admission, and 11(32.4%) of cases and 26(16.5%) control had labor >24 hours. Most (73.6%) of study subjects came from other health institutions. More cases (47, 85.5%) than controls (115, 69.7%) come by referral (Table 2).

Table 2. Obstetrics characteristics of study subject in Ayder Comprehensive Specialized Hospital from September 2012 to December 2017 (n=220).

Characteristics	Case (n %)	Control (n %)	Total (n %)
Parity of mothers			
≥5	35(63.6)	56(33.9)	91(41.4)
<5	20(36.4)	109(66.1)	129 (58.6)
Gestational age by week.			
≥42	6(10.9)	14(8.5)	20(9.1)
37-41	30(54.5)	131 (79.4)	161(73.2)
28-36	19(34.5)	20(12.1)	39(17.7)
Birth weight of new born in gram			
≥4000	8(14.5)	12(7.3)	20(9.1)
2500-3999	36(65.5)	136(82.4)	172(78.2)
≤2499	11(20.0)	17(10.3)	28(12.8)
Number of fetuses			
Multiple	2(3.6)	2(1.2)	4(1.8)
Singleton	53(96.4)	163(98.8)	216(98.2)
Antenatal care			
Yes	42(76.4)	156(94.5)	198(90.0)
No	13(23.6)	9(5.5)	22(10.0)
Mother comes with referral			
Yes	47(85.5)	115(69.7)	162(73.6)
No	8(14.5)	50(30.3)	58(26.4)
Is labor present			
Yes	34(61.8)	158(95.8)	192(87.3)
No	21(38.2)	7(4.2)	28(12.7)
Duration of labor in hours (n=192)			
≥24	11(32.4)	26(16.5)	
<24	23(67.6)	132(83.5)	

Mode of delivery of current pregnancy			
Abdominal delivery	51(92.7)	50(30.3)	101(45.9)
Vaginal delivery	4(7.3)	115(69.7)	119(54.1)
Uterine a tony			
Yes	17(30.9)	20(12.1)	37(16.8)
No	38(69.1)	145(87.9)	183(83.2)
Morbid adherent placenta			
Yes	15(27.3)	8(4.8%)	23(10.5)
No	40(72.7)	157(95.2)	197(89.5)
Chorioamnionitis			
Yes	4(2.4)	4(7.3)	8(3.6)
No	51(92.7)	161(97.6)	212(96.4)
Induction/Augmentation			
Yes	5(9.1)	18(10.9)	23(10.5)
No	50(90.9)	147(89.1)	197(89.5)
Premature rupture of membrane			
Yes	6(10.9)	25(15.2)	31(14.1)
No	49 (89.1)	140 (84.8)	189(85.9)
Uterine rupture			
Yes	21(38.2)	6(3.6)	27(12.3)
No	34(61.8)	159(96.4)	193(87.7)

Previous obstetrics characteristics of study subjects.

Additionally, this study shows that 8 (4.8%) of the controls and 5 (9.1%) of the patients had a history of pregnancy-induced hypertension. Twelve (7.3%) controls and eleven (20.0%) cases among the study participants had a history of antepartum hemorrhage. likewise, the study shows that 20 (36.4%) of the cases and 20 (12.1%) of the controls had previously undergone an abortion. More cases than controls had a history of previous cesarean sections (36.4% versus 18.2%), and the number of previous cesarean sections > 2 in the cases is also greater than in the controls group (13 (65.0%) versus 11 (36.7%) (Table3).

Table 3. Previous obstetrics characteristics of study subjects in Ayder Compressive Specialized Hospital from September 2012 to December 2017 (n=220).

Variables	**Case (n %)**	**Control (n %)**	**Total(n%)**
History of APH			
Yes	11(20.0)	12(7.3)	23(10.5)
No	44(80.0)	153(92.7)	197(89.5)

History of Abortion			
Yes	20(36.4)	20(12.1)	40(18.2)
No	35(63.6)	145(88.3)	180(82.4)
History of previous Cesarean section			
Yes	20(36.4)	30(18.2)	50(22.7)
No	35(63.6)	135(81.8)	170(77.3)
Number of previous cesarean section(n=50)			
≥2	13(65.0)	11(36.7)	24(48.0)
1	7(35.0)	19(63.3)	26(52.0)
Pregnancy-induced hypertension			
Yes	5(9.1)	8(4.8)	13(5.9)
No	50(90.9)	157(95.2)	207(94.1)

Indication and type of emergency obstetrics hysterectomy

The ruptured uterus was the commonest indication for the procedure, accounting for 38.2%, followed by uterine atony contributing to 31%, and others are morbid adherent placenta (MAP) with placenta previa16%, and a uterine inversion was an indication for about 3.6% of the hysterectomy (Fig 2).

Type of emergency obstetrics hysterectomy

Over half (61.8%) of the emergency obstetrics hysterectomy was subtotal. The majority (54.5%) of the hysterectomy were cesarean hysterectomies, while the rest, 38.0%, were done for uterine rupture by laparotomy. Only four (7.3%) hysterectomy were performed after vaginal delivery. More than half (59.3%) of uterine rupture was caused by obstructed labour.

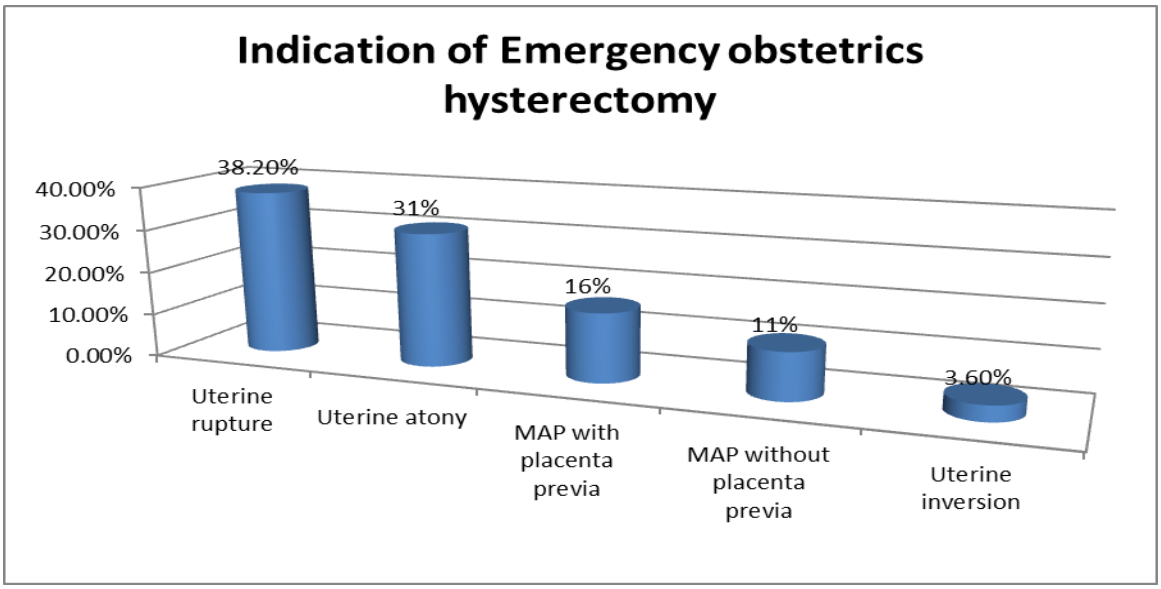

Figure 2. Indication of emergency obstetrics hysterectomy Ethiopia, Tigray, 2017.

Determinants of emergency obstetrics hysterectomy

Bivariate and multivariate logistic regression was calculated to evaluate the relationship between a few independent variables and emergency obstetric hysterectomy. A 95% confidence interval (CI) and p-value (<0.05) were used to evaluate for statistical association significance and determinants with a p-value <0.02 significant level in the bivariate logistic regression analysis were taken into account.

This study shows that grand multipara (parity > 5) was identified as the determinant of emergency obstetrics hysterectomy at [AOR = 4.218 (1.804-9.861), 95% C.I.]. Grand multi-parous mothers were 4.22 times more likely to have emergency obstetrics hysterectomy than mother parity<5. Uterine rupture was another identified determinant for emergency obstetric hysterectomy at (AOR = 19.816(6.186-63.472), 95% C.I.). Mothers who had uterine rupture were 19 times more likely to have emergency obstetrics hysterectomy than mothers with intact uterus.

Those mothers who had ANC follow-up were 78.7% times less likely to have emergency obstetrics hysterectomy than those who had no ANC follow-up [AOR=.213(.061-.746), 95% C.I]. The study subject with a previous cesarean section had 4.22 times higher odds of having EOH than the control at [AOR=4.217(1.671-10.642), 95% C.I]

The odds of requiring EOH were 4.28 times [AOR=4.282(1.200-15.286), 95% C.I] higher among mothers with a morbidly adherent placenta than those with no MAP. Uterine atony was also significantly associated with emergency obstetrics hysterectomy at [AOR=4.723(1.714-13.010), 95% C.I]. Mothers who have uterine atony are 4.7 times more likely to have an emergency hysterectomy than mothers who do not have uterine atony (Table 4).

Table 4. Bivariate and multivariate analysis of determinants of emergency obstetrics hysterectomy among the study subjects in Ayder Comprehensive Specialized Hospital from September 2012 to December 2017 (n=220).

Variables	Case (n %)	Controls (n%)	COR (95% C.I)	AOR (95%C.I)
Age of mother				
≥35	37(67.3)	84(50.9)	1.982(1.045-3.761)	2.221(.952-5.180)
<35	18(32.7)	81(49.1)	1	1
Parity of mothers				
≥5	35(63.6)	56(33.9)	3.406(1.802-6.440)	4.218(1.804-9.86)*
<5	20(36.4)	109(66.1)	1	**1**
ANC follow up				
Yes	42(76.4)	156(94.5)	.186(.075-.466)	.213(.061-.746)*
No	13(23.6)	9(5.5)	1	1
Previous cesarean section				
Yes	20(36.4)	30(18.2)	2.571(1.307-5.060)	4.217(1.671-10.64)*
No	35(63.6)	135(81.8)	1	1
MAP				
Yes	15(27.3)	8(4.8)	7.359(2.92-18.571)	4.282(1.200-15.286)*
No	40(72.7%)	157(95.2)	1	1
Uterine rupture				
Yes	21(38.2)	6(3.6)	16.368(6.143-43.61)	19.816(6.186-63.472)*
No	34(61.8)	159(96.4)	1	
Uterine a tony				
Yes	17(30.9)	20(12.1)	3.243(1.550-6.789)	4.723(1.714-13.010)*
No	38(69.1)	145(87.9)	1	1
Antepartum hemorrhage				
Yes	11(20.0)	12(7.3)	3.187(1.317-7.717)	1.451(.385-5.462)
No	44(80.0)	153(92.7)	1	1

DISCUSSION

In the event of potentially fatal obstetric bleeding, an emergency obstetric hysterectomy is a life-saving surgical surgery. The results of this study show that factors linked to emergency obstetric hysterectomy in the study environment included parity >5, ANC follow-up, prior cesarean section, morbid adherent placenta, uterine rupture, and uterine atony.

The odds of requiring emergency obstetrics hysterectomy were 4.22 times greater in grand multiparous than in among parity <5 (AOR =

4.218(1.8-9.861), 95% C.I.). This finding is similar to the study done in Nigeria, in which 60% of cases were grand multiparous (9), and also comparable to the study done in a tertiary hospital in Kuwait, in which more than half (53.3%) of cases were grand multiparous (18). This is also comparable with other studies done in Turkey and the United Kingdom (19, 20). The possible reason might be that as parity increases, the risk of uterine atony and placenta Previa also increases.

Another determinant for EOH in the current study was ANC follow-up. Accordingly, those mothers who had ANC follow-up were 78.7% less likely to have EOH than those who had no ANC follow-up. This finding is consistent with a study by VandenAkker et al. (11) which indicated that those mothers who had ANC follow-up were 88% less likely to have EOH than those who had no ANC follow-up This is also similar to a study done in Gelemso zonal hospital in Ethiopia, in which a majority (64.2%) of mothers who underwent EOH had no ANC follow-up (10) and a study done in the developing country of Sokoto, Nigeria, in which the majority of patients (89.2%) were unbooked for antenatal care and the rate of the procedure was higher than among booked subjects (P <0.001(15). The possible reason was that most mothers were referrals from rural areas, and most were grand multipara with low ANC follow-up. This is inconsistent with a study by Vanden Akker et al. (11), which indicated that those mothers who had ANC follow-up were 88% less likely to have EOH than those who had no ANC follow-up.

In this study, the odds of requiring EOH were 4.22 times [AOR=4.217(1.671-10.642), 95% C.I was more among those who had a history of a previous cesarean section than a counterpart. This is comparable to the study done worldwide by systematic review and meta-analysis in China, the United Kingdom, and Iran (11, 13, 20, 21). The possible reason for the previous caesarean section increases the risk of morbidity adherent placenta (accrete, increta, and percreta) and scar dehiscence during labor and delivery, which increases the risk of emergency obstetrics hysterectomy. The number of previous cesarean deliveries was an important risk factor for the morbidity of the adherent placenta (14,22).

This study indicates that mothers who had morbid adherent placenta were four times [AOR=4.282(1.200-15.286), 95% C.I] more likely to have EOH than those who did not have a morbid adherent placenta. This is comparable to other studies conducted in Nigeria, Turkey, Thailand, and Iran (9, 19, 21, 23). The possible reason was probably due to more cases having a history of previous cesarean section and less management of morbidly adherent placenta by medical and surgical conservative management. In developed countries, abnormal placenta invasion was the major associated determinant for EOH due to increments of cesarean section (24, 25).

In this study, the odds of requiring EOH were about five times [AOR=4.723(1.714-13.010), 95% C.I.] higher among mothers who had uterine atony than among those who had no uterine atony. This study is comparable to studies done in a tertiary teaching hospital in Kuwait, which indicates that more index cases had a history of atonic postpartum hemorrhage (46 vs. 4%, p <0.001 (18). and a study conducted at Allied Hospital Faisalabad in which uterine atony causes 44.23% of EOH (16). It may relate to postpartum bleeding, is physiologically controlled by constriction of

interlacing myometrium fibers, and when uterine a tony exists, the myometrium cannot contract. This study contradicts a study in Amino Kano, Nigeria, where uterine atony was not significantly associated with EOH (9). This is probably due to less conservative management/less response to conservative management in our study.

In the current study, uterine rupture was the identified determinant of EOH and was significantly associated with EOH (AOR=19.816(6.186-63.472), 95% C.I.). Those mothers who had uterine rupture were 19.82 times more likely to have EOH than have uterine rupture. This is also reported by studies done in developing countries like Aminukano, Nigeria, and Sokoto, Nigeria (9, 15), and in Gelemso zonal hospital in Ethiopia, 84.95% of mothers undergoing EOH had uterine rupture (10). Similarly, a study conducted by Nkwo et al. also indicates that the majority of 69.4% of mothers who underwent EOH had ruptured uteri from prolonged obstructed labour (26). Also, in south-west Nigeria, the uterine rupture caused 93.2% of EOH (15). The possible reason was that less conservative management of uterine rupture by medical management is less common in developing countries.

Limitations of the study

The study's limitations are related to the retrospective nature of the study design. Information about the patient, such as educational level and socio-economic status, which may be determinant factors of EOH, should have been included in their records.

Conclusion and recommendation

This current study indicates that factors such as grand mulliparity, uterine rupture, uterine atony, ANC follow-up, previous cesarean section, and morbid adherent placenta were determinants of emergency obstetrics hysterectomy. Prevention of uterine rupture and uterine atony, reducing pregnancies at high parity and reducing cesarean section rates, increasing antenatal care utilization, Active management of labour, early recognition of complications, and timely referral and encouraging health facility delivery will reduce the incidence of emergency obstetrics hysterectomy.

Lists of Abbreviations and Acronyms

AOR	Adjusted odds ratio
ANC	Antenatal Care
APH	Ante Partum Hemorrhage
CS	Caesarean Section
COR	Crude odds ratio
EmOC	Emergency Obstetric Care
EPH	Emergency Per partum Hysterectomy
EOH	Emergency Obstetric Hysterectomy
EDHS	Ethiopia Demographic Health Survey
GA	Gestational Age
MAP	morbid adherent placenta
NGO	Non-Governmental Organization
PPH	Post-Partum Hemorrhage

DECLARATIONS

Ethical approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Mekelle University, College of Health Sciences and an official letter of cooperation was given to Ayder Comprehensive Specialized Hospital for permission. Confidentiality was maintained for information, and the patient records were revised only for the study.

Availability of data and materials

The data sets of the current study will be available from the corresponding author upon reasonable request.

Competing of interests

The authors declare that they have no competing interest

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